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ABSTRACT

This paper advocates using teaching methods in math and social studies instruction that take into consideration the students' learning styles to increase achievement for at-risk students. Rural at-risk students need mathematics and social studies instruction that will prepare them for the 21st century. Traditional methods of instruction have not been successful for at-risk students. Teachers need to consider how environmental, emotional, sociological, physical, and psychological stimuli can be accommodated through instructional strategies. Learning styles are defined in terms of how individuals react to 21 elements of the instructional environment. Semantic mapping strategies can be used to provide structure for students who need it. Students who lack persistence can be given short tasks with breaks between them. Sociological needs of students can be accommodated through grouping students in pairs or cooperative learning groups. Physical needs of students can be met through hands-on activities and direct involvement. Academically at-risk students who are global learners benefit from strategies such as guided imagery, semantic maps, and story maps. Unit teaching offers a broad field for providing varied experience for individual students, appealing to a wide range of learning style preferences. This paper includes a list of suggested activities for a fifth grade unit on Native Americans that incorporates a variety of learning styles. (KS)

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Alternative Methods of Math and Social Studies Instruction for At-Risk Students Based on Learning Style Needs

Motivating students to learn and making learning meaningful are two factors that are the key to any child's academic success. However, despite a wealth of well-conducted research in the areas of math and social studies instruction, as well as learning styles research, some teachers continue to function in the "dark ages" in terms of the teaching-learning process. These teachers continue to use endless worksheets, workbook pages and review sheets to teach math and social studies. These materials are not motivating nor do they simulate a real learning experience. They certainly do not account for individual differences among students. In fact, for students having learning difficulties (academically at-risk students), they compound the problem by causing more stress and frustration with the process of learning mathematics skills and concepts, as well as social studies content. These traditional methods of instruction that are often practiced in rural classrooms, as well as others, do not accommodate the learning style needs of academically at-risk students. Lack of experiences of students in rural areas further emphasizes the need for nontraditional methods of instruction and meeting the learning style needs of these students.

Extensive data verify the existence of individual differences among youngsters - differences so extreme that identical methods, resources or grouping procedures can prevent or block learning for the majority of the students (Dunn & Dunn, 1979). Furthermore, strong intuitive appeal surrounds the notion that different individuals learn in different ways. Therefore, different activities or methodologies are required for each student to be successful.

Using teaching methods that take into consideration the students' learning styles can increase achievement (Wheeler, 1988). Research has continually shown (Carson & Bostick, 1988) that most students cannot learn effectively by only listening and imitating; yet most teachers continue to teach as they were taught, not as they were taught to teach. In fact, most of the failure in schools today is due to a tradition of teaching that is inappropriate to the way most students learn since many teachers are still teaching in the "pencil-and-paper" era.

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Although authorities in learning styles disagree about the individual style model that should be used, many agree that accommodating learning styles can produce an increase in achievement and attitude test scores, student morale, student self-confidence, and self-esteem (Brandt, 1990; Dunn, 1990; Hand, 1990; O'Neil, 1990). Reductions in the number of discipline referrals and in the amount of tension in schools have also been reported (Brunner & Majewski, 1990; Dunn, 1990). This evidence supports the fact that traditional methods of instruction are no longer enough to meet the needs of today's students. Furthermore, students simply do not retain for long what they learn by imitation from lectures, worksheets, or routine homework. Presentations and repetition may help students do well on tests and lower-order skills, but they are generally ineffective as teaching strategies for long-term learning, for higher-order thinking, and for versatile problem solving.

Need for Improvement in Math and Social Studies Instruction

According to Everybody Counts: A Report to the Nation on the Future of Mathematics Education (1989), the first high school graduates of the 21st century are currently enrolled in the third grade. Most of these students will leave school without sufficient preparation in mathematics to cope with either on-the-job demands for problem solving or college expectations for mathematical literacy. All of these students must receive mathematics instruction and preparation appropriate for the twenty-first century. To meet this goal, teachers must understand and emphasize that knowledge about and high academic performance in mathematics is the best way "up" for students from disadvantaged backgrounds. Furthermore, problem solving skills, use of the calculator and manipulatives in instruction, active engagement of students in the learning process, and mathematics based on real life experiences are emphasized in the new National Council of Teachers of Mathematics (1989) standards.

Additional research (Towery, 1989) points out that social studies instruction in the rural setting of one southern state reflected the national trends toward a text book based, test driven program which deemphasizes individual needs and does not address student diversity. Such an emphasis on knowledge acquisition and results (as opposed to process) tends to reinforce the "helplessness" and failure inherent in at-risk students (Alderman, 1990). In addition, rural school students lack the schema formation necessary for understanding such social studies concepts as communities and maps (Welton and Mallan, 1988). The rural at-risk school age child has less opportunity for the travel and interaction necessary to effectively develop a conceptual background than his/her advantaged counterpart.

Specific programs developed to address learning style, reading comprehension strategies and goal attainment have been successful in a number of studies (Alderman, 1990; Carbo, 1990; Brunner and Majewski, 1990). Mathematics and social studies content and skills instruction are easily adaptable to instructional strategies which allow students to develop as self-confident problem solvers, form appropriate conceptual schemes, and engage in instruction based on diagnosed learning styles and needs (Carson & Bostick, 1988; Jarolimek, 1990).

Academically At-Risk Students

According to O'Neil (1990), at-risk students, those with an increased chance of failure in school due to "personal behaviors, past educational records, or family problems" (p.5), have more to gain from alternative methods of instruction based on learning style needs. The overuse

of traditional methods of instruction and the lack of alternative methods often work against these underachieving students.

Droupouts, students that "can't make it" in school, have learning style needs that are not accommodated by the current system of education (O'Neil, 1990). These students tend to work better in soft light and an informal room design such as sitting on the floor; they prefer to work in pairs or groups, have a high need for movement, are not motivated, responsible, nor persistent, learn best through tactual or kinesthetic activities, and tend to be global and/or impulsive learners. These students are labeled as underachievers or problem students since their learning style profile does not match the teaching style of most classrooms. While many teachers are promoting quiet, independent studies, these students learn better through direct experience, cooperation, collaboration and interactions (O'Neil, 1990).

The fact that learning style based instruction is especially appropriate for academically at-risk students is supported by a variety of research. This research reports that positive effects abound when learning-style based instruction is used with special education students, under-achieving populations, students in low socioeconomic areas, minority students, and students who have experienced "traumatic family upheavals" (Dunn, 1990, p.17).

Traditional methods of instruction do not, as any singular method cannot, meet the needs of all students, especially the academically at-risk students. When students need remediation, time is usually spent reteaching material using the same initially ineffective methods. Repetition rarely works! More often than not, it simply reinforces previous failure. The best time to learn the material is when it is first taught; the best way to teach information is to teach it well the first time (Carson & Bostick, 1988). An effective teacher must consider the individual differences of children, adjust instruction to ensure children's success, provide motivating activities which actively involve children in the learning process, and remember that unsuccessful students may be students whose only problem is that their learning preference is different from the teacher's presentation (Gregorc, 1979).

Can Learning Styles Be Implemented with Strategies I Already Use?

Implementing a learning styles model does not mean restructuring an entire classroom. Through awareness of learning styles, teachers begin to realize that many of the instructional strategies and activities that they currently use in their classroom are accommodating individual learning preferences. Teachers need only to consider how each of the instructional activities work to accommodate students' learning preferences. This calls for more deliberate thoughtful planning of activities.

Two factors contribute to the ease of implementing learning styles. First, more than one area of stimuli (i.e., environmental, emotional, sociological, physical, and psychological) can be accommodated through a single instructional strategy. Second, individuals have a strong preference for only five or six elements (Dunn, Dunn, & Price, 1989). For the other elements, the individual usually has no preference one way or the other. It is not necessary to plan a multitude of different activities for each lesson.

How Can I Implement Learning Styles?

Before understanding how instructional activities and strategies relate to learning styles implementation, one must have a basic knowledge of learning styles. Learning styles (Dunn,

Dunn, & Price, 1989) are defined in terms of how individuals react to the 21 elements of instructional environment. The revised Learning Style Inventory (1989) assesses an individual's learning style preference in each of 21 different elements which are placed in five major categories: (a) environmental (sound, temperature, light, and design), (b) emotionality (motivation, persistence, responsibility, and structure), (c) sociological preferences (learning alone or with peers, learning with adults present, learning in combined ways, being motivated by the teacher, and being motivated by a parent), (d) physical characteristics (auditory, visual, tactual, and kinesthetic preferences, time of day preferences, need for intake, and need for mobility), and (e) psychological inclinations (global/analytic preferences, hemispheric preferences, and impulsive/reflective thinking).

The following sections will describe instructional strategies that can be used to accommodate some of the learning style preferences. Knowledgeable teachers can easily extend this list.

Emotional Stimuli

Students have increased comprehension when they are motivated to learn mathematics and social studies concepts and skills (Fass, & Schumacher, 1978). Motivation is usually linked with preference for persistence and responsibility. As stated earlier, academically at-risk students are usually not motivated, responsible, nor persistent; they also have a great need for structure.

The primary factor in accommodating these children is providing material that is interesting and meaningful and showing children how the material can be used in other situations. Students with these learning preferences need to be prepared for understanding the presented material. That is, the teacher must provide background knowledge, give a purpose for learning the information, concept, or skill, and divide long chapters or concepts into shorter units or subskills. Simply by giving students this guidance, teachers decrease the effort that the student must exert to understand the material and increase motivation (Irwin, 1990).

Mapping (or webbing) strategies can be used to provide structure for students who need it. Semantic maps illustrate new concepts and their relationship to other concepts (Pearson & Johnson, 1978). Before reading a social studies selection, students brainstorm anything that comes to mind concerning the topic of the selection. The teacher lists the words and phrases on the board and then puts them into a diagram which indicates the relationship among the ideas. After students have read the selection, they add additional concepts to the map.

A second type of map that can be used in social studies is the story map (Beck & McKeown, 1981) which is used with narrative text. The teacher prepares a story outline based on the contents of the selection which include appropriate elements such as the problem, plan, events, and/or resolution. After the students read the selection, the teacher and students fill out the map together using questions that the teacher has prepared to guide the completion of the map.

Mapping can also be used to help students read, understand, and compute the answers to word problems in math. The word problems used in this type of activity should be meaningful, interesting, and relate to real-word situations. The teacher prepares a visual outline for the problem similar to the outline prepared for the social studies example presented above. The teacher discusses the outline to give the students key points to find in their reading; the students read the word problem; the teacher and students fill out the map together; and the students compute the answer to the word problem.

Mapping provides students with motivation by giving them a task for which they can see an end and by providing structure that can be used in future learning. This assists them in staying on task, being involved, and completing the task with little assistance.

Students who lack persistence need short tasks with breaks between them. This can be accommodated very easily in the math classroom. If an assignment would normally include 25 problems, increase it to 32 problems. The divide it into quarters making it four small assignments of eight problems each. Let students pick six of the eight problems to complete. Given shorter assignments, a choice, and a short break between assignments, many less persistent students complete assignments they would not complete in traditional situations. After they finish the first assignment, success will build success, and they will be more motivated to finish the remaining assignments.

Students with low responsibility permit their attention to become diverted when a task becomes difficult. When working with these students, teachers should do three things. First, let the student know the teacher believes the task is important. Second, talk to the student like a colleaque; do not "talk down" to him/her. Finally, give the student a choice of how he/she will demonstrate the learning. Academically at-risk students will usually choose more nontraditional assignments when given a choice.

Sociological Stimuli

The sociological elements concern grouping students for instruction. There is no best way to group students for maximum learning. Students learn in a variety of sociological patterns that include working alone, with one or two friends, with a small group, with adults, or in any combination of these patterns. However, academically at-risk students usually prefer to work with one or two friends or a small group. These preferences are easily accommodated in the classroom. When an assignment in given, students can be given the option of working in any of the sociological grouping patterns. For example, one secondary math teacher decided to give choices on assignments. Students working in pairs and groups all had to turn in the same, completed assignment. However, each person had to check and sign-off on all other group members' work before giving it to the teacher to be graded. Each student was tested individually. After implementing this system of grouping, two boys in the class who had been failing math were receiving B's by the end of the semester. One of the boys went on to successfully complete an advanced math class the next year (Dotson, 1988).

Accommodating children whose preference is learning in combined ways (i.e., alone, with peers, and with adults) can be accomplished using cooperative learning. According to Slavin (1990), two concepts of Student Team Learning are essential for basic skills achievement - team rewards and individual accountability. Two general cooperative learning methods are Student Teams-Achievement Division (STAD) and Teams-Games-Tournaments (TGT).

In STAD, students are assigned to four-member heterogeneous teams. First, the teacher presents a lesson. The team members work together to make sure that everyone has mastered the concept. Finally, all students take individual quizzes on the material. TGT is similar to STAD except the quizzes are replaced with weekly tournaments in which students compete with members of other teams. Cooperative learning provides the opportunity for all students to receive explicit instruction from the teacher, work with their peers, and complete assignments individually, thereby accommodating the individual learning preference in combined ways.

Physical Stimuli

Academically at-risk students usually learn best through tactual or kinesthetic resources and have a high need for mobility. These students need to be physically involved in the learning process. They learn through hands-on activities and direct involvement. These children remember best what they have done, not seen nor heard.

Students who prefer to learn through tactual and kinesthetic means or who require mobility to learn can be accommodated through the following activities suggested by Duffy and Roeler (1989): (a) illustrate historical events or social studies selections through dioramas and shadow boxes, (b) make miniature stage settings using pipe-cleaner figures to describe selections in the social studies text, or (c) draw murals to illustrate social studies content.

All students, regardless of age, must have a good foundation in math to be successful in math. Specifically, academically at-risk students must have concrete objects to examine in order to understand what they are doing. Teachers need to begin teaching any concept or math skill to these students by using concrete objects such as base-ten blocks, chips or counters, fraction pies or squares, geometric figures, and the like before progressing to representational (pictures) and abstract (numbers) activities. These students must experience math with concrete materials and in terms of the real world to have a good foundation in learning mathematics. Using concrete materials does not encourage idle play time as some propose, it sets up situations that foster logical thought for these students.

Using tactual/kinesthetic activities should not be a problem for any math teacher since there are more manipulative objects available for teaching math concepts to the kinesthetic learner than any other curriculum area. These physical objects can be manipulated by students to learn numeration and notation, counting, addition, subtraction, multiplication, division, place value, problem solving, probability, and measurement. The tactual/kinesthetic learner who is having difficulty mastering math concepts may understand these concepts more easily when shown how to use concrete objects to represent number units. By manipulating blocks, the kinesthetic learner can begin to understand the relationship between numbers. After practice with the blocks, the kinesthetic learner will be able to complete computations without their use. The use of various manipulative objects enables the kinesthetic learner to understand new math concepts and reinforces basic math skills (Carson & Bostick, 1988).

Psychological Stimuli

Academically at-risk students who learn best through global techniques, who are right-brain processors, and who are impulsive thinkers tend to learn best with an overall picture of the concept (Dunn, Dunn & Price, 1981). These students are simultaneous learners. Teachers should redirect students' attention by asking how things make sense within the entire passage in social studies or the entire word problem or concept in mathematics and emphasize relationships of specific facts to overall meaning (Walker, 1988). Strategies that can accommodate these learners include guided imagery, semantic maps, and story maps. All of these strategies guide the reader to examine the whole text or content, rather than first examining separate ideas and then putting them together.

Effective teachers realize that global learners process information in a whole-to-part format. They need to see the entire picture before they concentrate on the smaller steps. In other words, they need to know where they are going before they find out how to get there. These students need to grasp the entire concept before they are ready to see the details (Dunn, 1988).

In mathematics , for example, after working with concrete objects to understand the concept of division, they need to see the long division problem completely worked before they are ready to take the process apart and put it back together in a step-by-step process.

How can I provide for varied learning styles using instructional units?

As mentioned earlier, previous work by one of the authors (Towery, 1989) has indicated the need for incorporating instructional strategies into elementary social studies which better meet the learning needs of rural children. The difficulties teachers encounter in incorporating varied strategies into their program may somewhat be overcome by use of unit teaching plans which incorporate a variety of instructional approaches into the classroom melieu. Unit teaching has been utilized for a long (at least in educational terms) time. Hanna, Potter, and Hagaman (1958) provide an excellent rationale for the development of teaching units based on the developmental and psychological needs of children. Research reports presented in Lemlech's (1990) text on general methods of elementary teaching indicate increased student learning when units of study using two interacting instructional methods are used.

Despite the value and tenure of unit teaching, many teachers remain more comfortable with textbook instruction. However, the value of the unit approach should not be overlooked (Van Cleaf, 1991). The unit (instructional activities built around a social studies topic) offers a much broader field for providing varied experiences for individual students than do textbooks (Kenworthy, 1981; Jarolimek, 1991). Furthermore, units may be structured to both the needs of children and the resources of the school (Van Cleaf, 1991). Finally, subject field units may be organized around a specific topic in social studies and may incorporate learning activities from other subject areas (Lemlech, 1990). Thus, the teaching unit provides an avenue by which the elementary teacher may offer a variety of learning experiences which will enhance the learning of children by the appeal to a wide range of learning style preferences.

For purposes of illustration (see figure 1) an outline of activities which might be incorporated into an elementary social studies unit is provided. This example demonstrates how the unit teaching approach can include a wide variety of learning experiences during the duration of instruction. The focus of the example is on strategies and activities, not on content. There is no attempt to meet all 21 learning preferences either daily or over the course of the unit. Rather, the emphasis is on demonstrating how a wide variety of experiences may be offered over a three week period. In addition, the reader will note the use of an activity to assist schema development prior to reading (Duffy & Roehler, 1986); integrated literature and language arts activities (Cox, 1988), and the use of flexible grouping patterns based on interest, need, and ability.

The example unit does presuppose that students are familiar with the strategies and not all activities need explanation. The best way to begin is to teach the students one new activity in each unit. Repeated use of the strategies will make it a part of not only the teacher's repertoire, but the students' as well.

FIGURE 1: Suggested Activities for a Fifth Grade Unit on Native Americans

DAY	*ACTIVITIES*	*PURPOSE*
1	The whole class views a video on life among the Plains Indians with pre and post viewing discussion/questioning. Students then view a display of Native American artifacts and talk informally about the items on display.	Develop background knowledge for schema formation using several physical characteristics Motivate
2	The teacher leads the whole group in a mapping activity to identify possible topics for student research. Students select a topic and are allowed to work in pairs or alone to research their selection through reading resource publications, or trade books, construction activities, and sociodrama.	Provide a purpose for research, reading, and information gathering Allow a choice in work assignments based on interest and need Develop persistence and responsibility
3 - 7	Students are assigned to work on their projects for part of the period in the room. They are allowed to use the media center and room resources. A portion of the assignment is to be completed at home. During part of the period, the teacher reads from trade books about Native Americans. There is a rich source of materials. Students enter into large and small group activities such as writing, simulations, problem solving, and viewing filmstrips. Additional activities are provided in learning centers for those students finishing early.	Use varied physical learning characteristics Build background knowledge Develop research skills Allow a choice in working alone or together Allow for different psychological inclinations
8 - 9	The students make oral or written reports of their findings along with displays (from a wide choice of options, i.e. dioramas, charts murals) illustrating their work.	Motivate Share information Build concepts Allow for creativity Develop collateral language skills

10-11	Students are assigned to a cooperative team of three to search the text and other sources for information to insure that all necessary information to meet the unit objectives has been covered.	Develop social skills Provide for peer motivation
12	A whole group activity using games such as Jeopardy or other variations on game shows is used to review student learning.	Motivate Provide for formative evaluation
13	A written test with provision for any students with learning disabilities or other needs is administered.	Assess mastery of knowledge and skills
14-15	The teacher pulls individuals and/or small groups to re-teach concepts missed on test. Students engage in additional time in the learning centers or performing enrichment activities in writing, filmstrip making, or reading.	Re-teaching Allow a choice in psychological and physical learning preferences

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Conclusion

Many teachers find the learning styles model hard to accept because they feel that accommodating all the variables is much too difficult a task. An important factor to remember is that any teacher who plans to undertake the implementation of a learning styles model should do so slowly - one step at a time (Dunn & Dunn, 1979). Start with one or two elements and gradually add other elements. However, student interest, motivation, and knowledge may be increased by using a variety of learning strategies in the elementary classroom. Effective teachers make use of activities which allow student choice in some activities and structure instruction to meet the learning needs of a broad range of students. A vast number of instructional techniques may be used in math and social studies to enhance learning. One excellent way to integrate a number of these activities is to use the teaching unit. There is no shortage of techniques which require little other than hard work to develop. The challenge for all of us in the rural schools of America is to use the knowledge we have and not become complacent followers of the text.

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